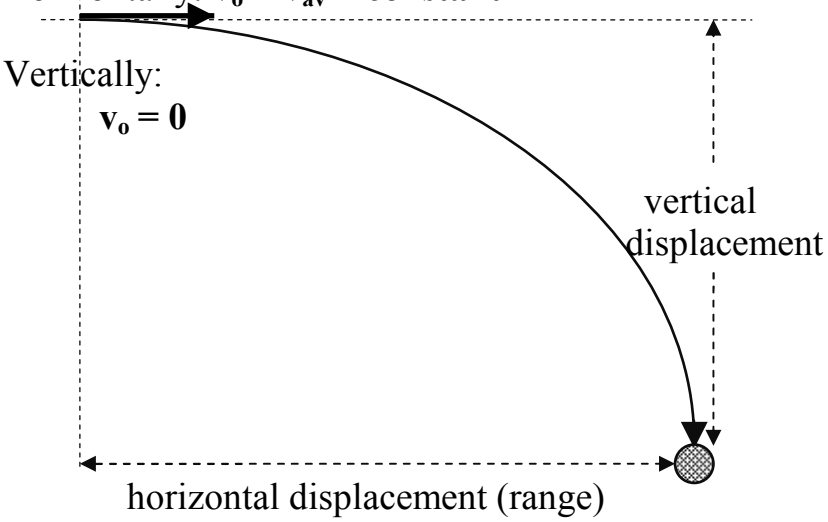
Horizontal Projectile Motion

Now we examine a two-dimensional motion problem taught in Physics 11, where a projectile is launched horizontally from a point above the ground.

Recall the following:

- horizontal motion is <u>unrelated</u> to vertical motion
- gravity acts only in the vertical direction; ∴ horizontal velocity must be *<u>constant</u>*
- horizontal displacement can be found using **$d = v_{av}t$**
- kinematics formulas can be used when dealing with vertical displacement

Horizontally: **$v_o = v_{av}$ = constant**



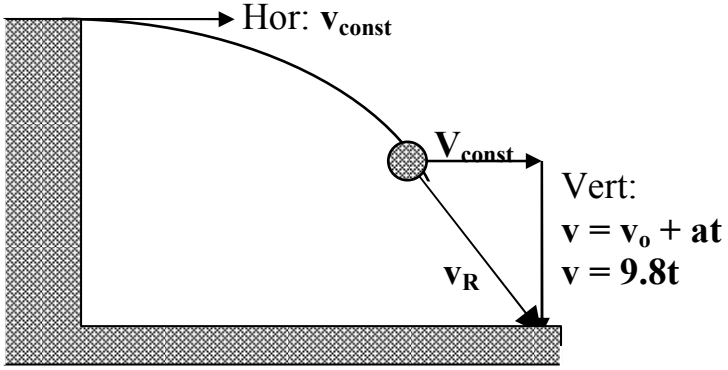
Use a table to list information:

Hor.	Vert.
v = constant	**$v_o = 0$**
a = 0	**a = -9.8**

- one more piece of information must be provided

Note: the vertical displacement in this situation is <u>negative</u>, as the projectile is only travelling forward and <u>down</u>.

To find the final velocity on landing (or at any other time **t**), you must use the horizontal and vertical components of the velocity to create a triangle and solve for the resultant **v_R**:



Use Pythagoras and trigonometry to solve for **v_R**.

Example 4.
A car going 22.0 m/s runs off a 50.0 m-high cliff.

a) **How long does the car take to hit the ground?**
b) **What is the range of the car?**
c) **With what speed and direction does it hit?**

(see Projectiles Ex 4 for answer)